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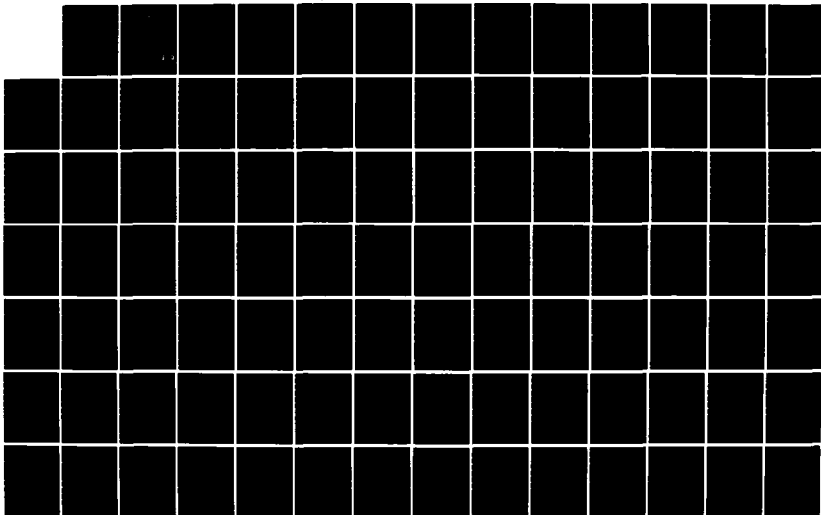
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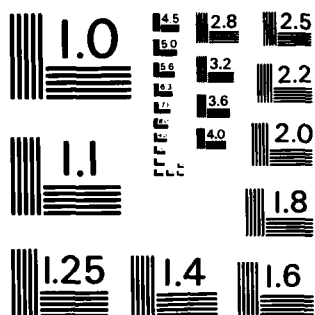
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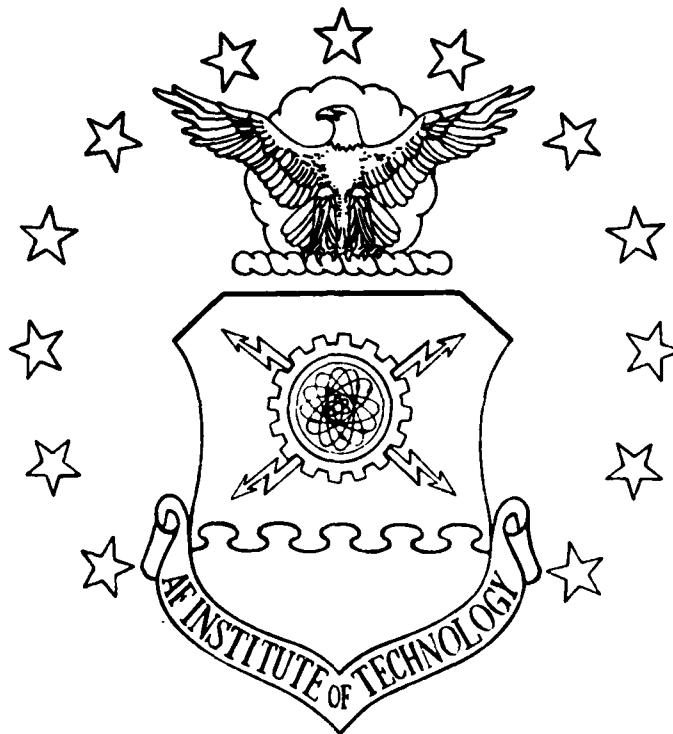
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A STUDY OF AIR FORCE QUALITY CIRCLE
PROGRAM EFFECTIVENESS AS VIEWED THROUGH
FACILITATOR'S PERCEPTIONS

THESIS

Donald R. Murvin Nolan L. Singer
Captain, USAF Captain, USAF

AFIT/GLM/LSM/84S-49

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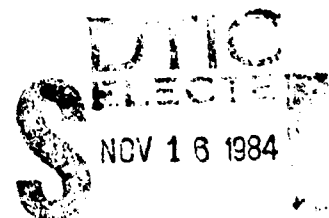
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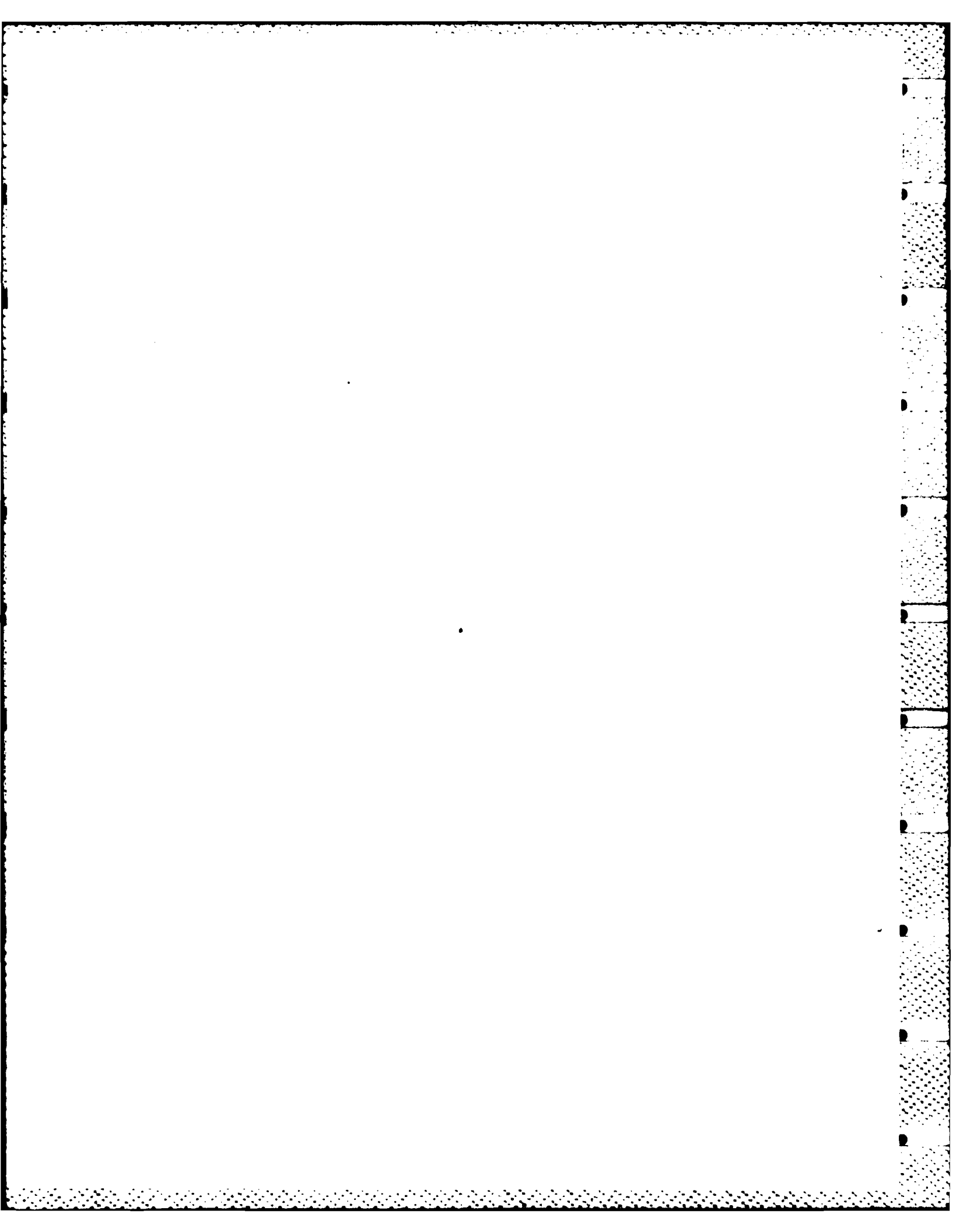


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**A STUDY OF AIR FORCE QUALITY CIRCLE
PROGRAM EFFECTIVENESS AS VIEWED THROUGH
FACILITATOR'S PERCEPTIONS**

THESIS

**Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University**

**In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management**

**Donald R. Murvin, B.S.
Captain, USAF**

**Nolan L. Singer, B.S.
Captain, USAF**

September 1984

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Donald R. Murvin

Nolan L. Singer

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Abstract

Quality Circles are a Japanese management tool for improving productivity and quality which is gaining wide-spread attention from American management, including the United States Air Force. Since August 1981, the Air Force Institute of Technology, School of Systems and Logistics, Department of Organizational Behavior and Science (AFIT/LSB) has been training both Air Force civilian and military personnel to function as Air Force Quality Circle facilitators. However, no research has been done to determine whether the Quality Circle programs of these AFIT-trained facilitators are effective in improving their organizations' productivity. This thesis project was an exploratory effort to determine the effectiveness of Air Force Quality Circle programs as perceived by the facilitators, and to identify characteristics present in effective programs.

Literature was reviewed which discussed the history of Quality Circles, application and results of Quality Circle implementation, and elements instrumental in successful Quality Circle programs. Air Force military personnel trained by AFIT/LSB as Quality Circle facilitators were surveyed to determine their Quality Circle programs'

perceived effectiveness, and to determine characteristics of those programs contributing to their success. Only the use of a written implementation plan surfaced as significantly related to the effectiveness of those programs. This factor, as well as other characteristics examined and their findings, are presented, and recommendations for future research provided.

A STUDY OF AIR FORCE QUALITY CIRCLE PROGRAM EFFECTIVENESS AS VIEWED THROUGH FACILITATOR'S PERCEPTIONS

1. Introduction

General Issue

Quality Circles have been credited with key contributions to Japanese industrial effectiveness (Ingle, 1982), and as a result, American management has begun to view the Quality Circle as a valuable management tool. Literature reviewed indicates that much of this understanding is clouded by distorted reports of success and a misunderstanding of the elements necessary for an effective quality circle (Goodfellow, 1981; Hayes, 1981; Ingle, 1982; Johnson & Ouchi, 1974; Klein, 1981; Mento, 1982; Wood, Hull, & Azumi, 1983). Since the Department of Defense and the Air Force in particular are currently using Quality Circles in several organizations, the need exists to determine what makes a successful Quality Circle so that their effectiveness can be determined.

Research Problem

Difficulty arises in determining if the Air Force Quality Circle program has been effective. This is due, in part, to the fact there has been no comprehensive gathering

of data on Quality Circles in the Air Force. This research effort is an exploratory effort addressed to this problem.

Research Objective

This research provides some descriptive data on the Air Force Quality Circle program. Information was gathered from Air Force Quality Circle facilitators who provided an assessment of the makeup and effectiveness of their individual Quality Circles. This information was compiled and the results analyzed. Conclusions were highly tentative. However, this survey attempted to evaluate four hypotheses:

1. The effectiveness of a Quality Circle program is significantly dependent upon the quantity and quality of the training received by facilitators, and subsequently passed on to the Circle members during their initial and advanced training.
2. The amount and type of management and union involvement impacts upon the effectiveness of a Quality Circle program.
3. The frequency of Quality Circle meetings and the number of participants impacts upon the effectiveness of a Quality Circle program.
4. Detailed planning for the implementation and operation of a Quality Circle program improves the effectiveness of that program.

A Key Definition

In order to study Air Force Quality Circles, a common understanding of what they are and why they exist is helpful. Literature reviewed cited many components to a definition of a Quality Circle, but one comprehensive

definition by Cole (1980) encompasses most of these and is used here as the basis for this understanding. It states:

A Quality Circle is a relatively autonomous unit composed of a small group of workers (ideally about ten), usually led by a foreman or senior worker and organized in each work unit. Participants are taught elementary techniques of problem solving including statistical methods. It is in principle a voluntary study group that concentrates on solving job-related quality problems. These problems are broadly conceived as improving methods of production as part of company-wide efforts. Some typical efforts include reducing defects, scrap, rework, and down-time. These activities in turn are expected to lead to cost-reduction and increased productivity. At the same time, the circles focus on improving working conditions and the self-development of workers. The latter includes: development of leadership abilities of foreman and worker, skill development among workers, improvement of worker morale and motivation, the stimulation of teamwork within work groups, and recognition of worker achievements. Above all, the circles involve recognition that hourly workers have an important contribution to make to the organization (Cole, 1980, p.24).

II. Literature Review

Purpose

This section reviews selected literature on Quality Circles in Japan, their origin, their importation into the United States, their use as a management tool, and reports on the effectiveness of Quality Circles. Additionally, key elements considered integral to an effective Quality Circle program are identified from the literature.

Justification

Japan's economic success and its successful penetration of Western markets are clearly cause for increased attention towards their management techniques (Alexander, 1981). In a comparison of international productivity costs, Capdevielle and Neef found that during the period from 1973 to 1979, productivity in Japan increased more than five percent per year while American output during this same period increased at a rate of only one to three percent per year (Capdevielle & Neef, 1980). During the same period, Japanese labor costs actually decreased, so the productivity increases were even larger. In contrast, American labor costs increased during this period while productivity slowed (Capdevielle & Neef, 1980). A portion of the credit for this gain in Japanese productivity has been attributed to the use of Quality Circles (Ingle, 1982). To better compete with Japanese industry, American industry needs to improve its understanding of how Quality Circles work for the Japanese

and possibly apply this understanding to its own management style (Ingle, 1982). This need for increased understanding warrants in-depth research into the Quality Circle process.

Scope

Due to the relative infancy of Quality Circles in America, this review is limited to literature written primarily during the last ten years. Additionally, as the bulk of this literature discussed Quality Circles in Japan and related then to American applications and results, this review will be limited to those two countries, their experiences, and their successes.

Method of Treatment and Organization

This review will examine available literature on Quality Circles to include the followings:

1. Japanese use of and success with Quality Circles, including a historical background on the evolution of Quality Circle principles and techniques.
2. A brief review of reports of Quality Circle successes in Japan.
3. American experiences with Quality Circles.
4. A brief review of several research efforts on the effectiveness of Quality Circle programs in the United States.
5. Key elements identified as necessary for Quality Circle program success.
6. A brief discussion of the reviewed reports on Quality Circles, factors influencing the chances of success, and differences in American and Japanese culture that might affect the Quality Circle process.

Quality Circles in Japan

The available literature credits the Union of Japanese Scientists and Engineers (JUSE) with the origination of Quality Circles as they are known today (Cole, 1980; Davidson, 1982; Deming, 1980; Karatsu, 1982; Patchin, 1980; Wood et al., 1983). This same literature identifies two American advocates of statistical quality control, Dr. William E. Deming and Dr. J. M. Juran, as introducing these concepts to Japan in the 1950's (Cole, 1980; Davidson, 1982; Deming, 1980; Karatsu, 1982; Patchin, 1980; Wood et al., 1983). Dr. Deming conveyed his ideas to members of the JUSE in 1950 at a time when Japan's main concern was with the recovery of its industry and improvement of the quality of its products following World War II (Cole, 1980; Deming, 1980; Patchin, 1980).

The original ideas of Dr. Deming were related to methodologies whereby quality control engineers could identify and solve work-related problems (Deming, 1980; Wood et al., 1983). In 1954, Dr. Juran added the idea that quality control and its methods should be the responsibility of middle management and workers throughout the company - not solely quality control engineers (Cole, 1980; Juran, 1967; Patchin, 1980). The JUSE adapted Dr. Deming and Dr. Juran's teachings to the Japanese method of "work in small groups" (Cole, 1980; Davidson, 1982; Juran, 1967; Samiee, 1982), and in 1962 the first quality circles were formed, involving workers and first-line supervisors in the quality

control process (Rehg, 1978; Wood et al., 1983). Japan's Quality Circles were then a logical outgrowth of Western ideas concerning quality control impacting upon an Eastern culture (Cole, 1980).

Literature reviewed contended that successful Quality Circles in Japan result from characteristics of the Japanese culture and management style (Johnson & Ouchi, 1974; Mento, 1982; Moran, 1979). This management style is built on the philosophy of group harmony (Moran, 1979). Johnson and Ouchi express an opinion that concern for the employee and the product are inseparable (Johnson & Ouchi, 1974), and that the Japanese manager cannot isolate himself from his employees and expect a harmonious working environment (Johnson & Ouchi, 1974). As a result, management necessarily includes the employee in the decision-making process. The Quality Circle is the means by which this is accomplished.

Related to group harmony, but from the worker's view, Quality Circles facilitate the team orientation which is characteristic of Japanese workers (Wood et al., 1983). The Japanese employee's life is intertwined with the fortunes of his company and this "belonging", according to the research, contributes to the success of the Quality Circle (Johnson & Ouchi, 1974; Mento, 1982; Moran, 1979). Moran states that in Japan decision-making is decentralized (Moran, 1979). Johnson and Ouchi reinforce this view by stating that the Japanese manager desires solutions from below based on a

philosophy that those closest to the problem will provide the best solution (Johnson & Ouchi, 1974). Quality Circles provide an effective means to elicit these decentralized decisions from the workers themselves (Johnson & Ouchi, 1974; Moran, 1979) and they provide feedback desired by management (Hayes, 1981; Johnson & Ouchi, 1974).

Reports of Quality Circle Success in Japan

Literature is readily available which trumpets the success of Quality Circles in industrial Japan. Goodfellow uses the example of Nippon Steel, the largest steel maker in the world, to illustrate the effect which Quality Circles are presumed to have had on Japanese industry. Nippon Steel estimates that 25% of its profits result from the Quality Circle activities of its shop-floor personnel (Goodfellow, 1981). It is estimated that more than ten million people participate in Quality Circle programs in Japan, contributing 20 to 25 billion dollars of savings per year (Ingle, 1982). Other estimates of worker participation project that nearly one-fourth of all Japanese hourly employees are members of a voluntary Quality Circle (Davidson, 1982).

Other literature reports that Japanese worker Quality Circle program participation and their results do not explain Japan's industrial growth. Wood et al. point out that the majority of Japanese employees are not Quality Circle members and that Quality Circle contributions to the

productivity achievements of Japanese industry are modest when compared with other factors (Wood et al., 1983). In support of this contention, Juran (1982) states that his discussions with Japanese manufacturers suggest that only ten percent of the quality revolution in Japan could be attributed to Quality Circles. Hayes (1981) wrote that Japanese Quality Circles are not as influential or successful as American business managers might think. He went on to state that most of the Japanese plants he visited had in fact experienced problems with Quality Circles up to four years after their introduction. His viewpoint credited Japanese management, not Quality Circles per se, with increased Japanese quality (Hayes, 1981).

Even though many skeptics discount the role of Quality Circles in contributing to industrial growth in Japan, many managers in the United States have demonstrated their basic faith in this technique by instituting Quality Circle programs (Yager, 1980). The experience of organizations in the United States with Quality Circles will ultimately determine their lasting impact upon management practices in this country.

Quality Circles in the United States

The use of Quality Circles in the United States began at Lockheed Missile and Space Company in 1974 (Patchin, 1980; Wood et al., 1983). Estimates of the number of companies that have implemented quality circles since then

have put the number in the thousands (Wood et al., 1983). In essence, the literature indicates that Quality Circles are being exported from Japan to America, yet the statistical quality control concepts were introduced by Drs. Deming and Juran to Japan in the 1950's (Davidson, 1982; Karatsu, 1982). Simply stated, Quality Circle principles have gone full circle from America to Japan and now back to America (Yager, 1980).

Several characteristics of American business and culture that may hinder successful Quality Circle operation in the United States were identified. The American philosophies of equality and "rugged individualism" (Hayes, 1981; Johnson & Ouchi, 1974) were identified as potential hindrances to the Quality Circle process. Moran stated that managers are responsible for the results of decisions made in their area of responsibility and are reluctant to let others guide their destiny (Moran, 1979). Yager contends managers are afraid Quality Circles might force them into support and research roles that would degrade their supervisory authority (Yager, 1980), and cost them their individuality (Johnson & Ouchi, 1974). This individualism and desire to "make the decision your own" hinders the quality circle process which is based upon the group process and shared decision-making (Alexander, 1981).

American management's philosophy of "us against them" (Klein, 1981) when dealing with employees prevents cooperation in developing and implementing a group

decision-making process (Moran, 1979). This philosophy tends to adversely impact the Quality Circle process, not only in the developmental stage, but also after Quality Circles have been established for some time (Cole, 1980).

Organized labor in this country also has a role in the Quality Circle process (Cole, 1980; Samiee, 1982; Yager, 1980). Unions do not adversely impact the Quality Circle process by their mere existence. However, they may perceive

Quality Circles as a management device to "...exploit workers by having them solve management's problems without sharing in the rewards" (Wood et al., 1983, p.49).

Additionally, Wood et al. state that unions, like managers, are another power base whose authority is potentially threatened by Quality Circles (Wood et al., 1983).

Reports of Quality Circle Success in the United States

Whether or not Quality Circle programs will work in industrial America remains to be seen. Reports of their effectiveness in the United States have been hindered by their relative infancy and the resulting lack of history with which to compare. Additionally, measurement of some of their purported benefits are sometimes difficult to quantify for scientific analysis. Nevertheless, research has occurred. Steel and Shane (1984) classify this research into two principal categories: reports of anecdotal appraisals and cost saving data offered by program sponsors

as evidence of program accomplishments and more conventional evaluative research.

Anecdotal reports of Quality Circle financial successes are readily available. Lockheed's Quality Circles have accounted for an estimated savings of between three and five million dollars over a four year period (Goodfellow, 1981; Wood et al., 1983). The Norfolk Naval Shipyard reported savings of \$3.41 for every \$1 invested in Quality Circles during an eighteen month period (Wood et al., 1983). Johnson & Johnson reported savings of \$480,000 on one project due to Quality Circle efforts (Goodfellow, 1981). A total of \$48,000 per year in savings was claimed by an American steel company due to the efforts of one Quality Circle (Goodfellow, 1981). In addition, Honeywell Corporation had one suggestion from a Quality Circle that resulted in a cost savings of \$32,000, and overall Quality Circle suggestions have resulted in an estimated savings of several million dollars for the company (Kanarick, 1981).

Evaluative research on Quality Circle effects are available although each must be examined for design flaws and limitations. Steel and Shane (1984) warn against total reliance on anecdotal appraisals and cost savings data offered by program sponsors as evidence of program accomplishments. This is due to the unscientific nature in which these data were typically derived. They state:

Such reports frequently provide estimates of anticipated savings rather than actual cost reductions and make overbroad assumptions

regarding the productive utilization of work time stemming from labor saving efficiencies. Therefore, the findings of such reports must be viewed with some measure of caution (Steel and Shane, 1984, p.4).

No judgment is made in this report as to the reliability of the research efforts reviewed. Rather, the results are presented here as an indicator of the research efforts accomplished thus far, and the contradictory nature of their findings.

Several research efforts report findings of positive Quality Circle effects. These include both performance results (i.e., improved machine utilization, improved productivity, reduction in assembly line costs, etc.) and attitudinal results (i.e., improved employee attitudes, etc).

Donovan and Van Horn (1980) employed measurement techniques and tools of their own design to evaluate the performance of five Quality Circle programs at Honeywell. They concluded that in all five cases, the Quality Circles contributed to improved performance over similar activities not employing Quality Circles. These results are tempered by their lack of statistical analysis (cf. Steel and Shane, 1984).

Successful Quality Circle results in terms of behavioral and attitudinal criteria were reported in research by Hunt at two General Dynamics plants (Hunt, 1981). Her techniques involved field observations of one variable, the Quality Circle, interjected into the regular

working environment. Although many behavioral benefits were cited as a result of the Quality Circles, only an increase in employee suggestions was statistically significant (Hunt, 1981).

In a study of Quality Circle activities at Martin Marietta Aerospace, Michoud Division, Tortorich, Thompson, Orfan, Layfield, Dreyfus, and Kelly (1981) attempted to measure the impact of Quality Circles on the organization by surveying 25 employee attitudes. They concluded that:

...evidence collected thus far suggests that Quality Circle participation has marked effect on employee attitudes toward themselves, their co-workers, supervision, and the opportunities for personal growth and development within the organization. In short, Circles contribute to a healthier organizational climate (Tortorich et al., 1981, p. 28).

Again, design limitations must be considered when viewing their analysis. Steel and Shane (1984) point to the absence of statistical analysis on the objective criteria and no baseline measure of attitudes as cautionary factors limiting the reliability of these findings.

Not all of the literature reviewed concluded that Quality Circles were significantly beneficial. Steel, Ovalle, and Lloyd (1982) cite the absence of systematic and controlled evaluative research on the effects of Quality Circle programs as an obstacle to their wholesale implementation. In their research on six Department of Defense Quality Circles at one installation, the results suggested that participation in the Quality Circles surveyed

had minimal impact on the attitudinal responses of participants during the study period. They tempered their conclusions by suggesting that their findings were highly tentative due to research design limitations, and they suggested further research accordingly (Steel et al., 1982).

Sander and Atwater (1983) attempted to evaluate the effects of Quality Circle programs on employee attitudes and performance measurements in three United States Navy organizations during 1982. Steel and Shane (1984) reported that Sander and Atwater found no significant effect on either attitudinal or objective measures as a result of Quality Circle implementation in these three organizations.

Crawford's (1983) report on Quality Circles in the federal government highlights the problems with current measurement of the effectiveness of Quality Circles. He reported many benefits were claimed as attributable to Quality Circles, but measurements of these benefits were inadequate to support accurate analysis. As a result, he concluded that, for his research, it would be extremely difficult to determine if the costs of Quality Circles in the government sector exceeded the benefits derived from them (Crawford, 1983). The questionable quality of these research efforts and the ambiguity of their findings confirm the need for additional research to determine whether Quality Circles can be effective in the United States. With Quality Circles still in their infancy, it remains to be seen whether they can be adapted to organizational life in

American society and achieve the benefits which they are purported to offer.

Elements of a Successful Quality Circle

From the literature reviewed we identified seven elements which are reputed to be necessary for a successful Quality Circle program. These include : 1) management support; 2) feedback or communication; 3) an emphasis on improving quality, not quantity; 4) trust; 5) training and development; 6) employee commitment ; and 7) recognition (Alexander, 1981; Bryant & Kearns, 1981; Cole, 1980; Dailey & Kagerer, 1982; Sikes, Connell, & Donovan, 1983).

Alexander (1981) contends active management support of the Quality Circle program is instrumental to the success of the program. Accordingly, if management ignores Quality Circle recommendations or hinders its activities, then he believes the Quality Circle efforts will be wasted and participation will cease. Bryant & Kearns (1981) and Sikes et al. (1983) both support Alexander's view.

For success in a Quality Circle program there should be a free-flow of information both up and down the organizational structure (Alexander, 1981). According to Alexander, if management withholds valuable information from the Quality Circle, then the Quality Circle will not be able to make an informed recommendation for a problem. Likewise, if the Quality Circle fails to communicate its needs and

decisions to management, then assistance and implementation of the decision by management won't occur.

Bryant & Kearns (1981) stress that Quality Circles should emphasize quality - not quantity - in their Quality Circle programs. They propose that expansion will occur on its own as word of successful recommendations spreads.

Cole (1980) and Alexander (1981) both suggest that for a Quality Circle to be successful, management must have trust in the quality of the Quality Circle's decision. If management can't have faith in the recommendation, then there is no point in forming the Quality Circle in the first place. To ensure this, it is necessary for members to provide quality decisions since quality decisions will reinforce management's trust.

Several authors espouse that to be a successful Quality Circle, the facilitator must insure members are taught Quality Circle procedures, and, they must be followed (Alexander, 1981; Bryant & Kearns, 1981; Cole, 1980; Dally & Kagerer, 1982). A well-trained Quality Circle will understand its role, and therefore should provide better recommendations.

Successful Quality Circles characteristically have employees who are motivated and enthusiastic about the program. This is developed through team spirit and "...a high degree of commitment which comes from decisions made through a group process" (Sikes et al., 1983, p.95).

Sikes et al. (1983) believe that in successful Quality Circle programs, management ensures that the Quality Circle receives credit for problem solutions it provides. This recognition relates to motivating the employees to participate and is an integral part of the feedback process.

In addition to the seven characteristics described above for successful Quality Circles, other program elements are helpful. These include: the ability to wait in making a decision until all sides are heard (Alexander, 1981); shared responsibility by all Quality Circle members for decisions made (Alexander, 1981; Cole, 1980); employee devotion to the future well-being of the company (Cole, 1980); and, where the organization is union-organized, union inclusion in discussions when establishing the Quality Circle program is helpful (Alexander, 1981; Bryant & Kearns, 1981; Cole, 1980; Dailey & Kagerer, 1982).

Discussion of the Literature Reviewed

Several authors agreed that because it is the successful rather than unsuccessful cases of Quality Circles that tend to be publicized, and then only to a limited extent, assumptions that are drawn from these cases about Quality Circles and workers in general tend to be distorted (Goodfellow, 1981; Klein, 1981; Wood et al., 1983). The publicity attending successful cases can easily lead to assumptions that all a company need do is bring workers together, make a case for a need for improvement, and then

turn them loose (Klein, 1981). The subjective measurements of some Quality Circle benefits lead to inconsistent evaluations where the results reported are successes whose true merits are distorted (Mento, 1982; Wood et al., 1983). The report by Steel and Shane (1984) points out the problem of consistent, statistically relevant evaluation. Reports of successful cases tend to ignore industry differences that may lead to different reactions to Quality Circle programs (Klein, 1981) or other factors that could affect the success of a Quality Circle.

Wood et al. (1983) point out numerous examples of factors that could affect the Quality Circle. Most often mentioned was the effect management's support (or lack thereof) had on the success of the Quality Circle program. If management's expectations of success were too high, then the Quality Circle could be choked by the pressure to perform and personal creativity possibly stifled (Wood et al., 1983). Also, middle management may fear losing its authority (Wood et al., 1983). Another factor suggested as an influence on the success of a Quality Circle program was the type of organization sponsoring the Quality Circle activity. Quality Circles may not work in all organizations and with all technologies (Mento, 1982; Wood et al., 1983). An organization that compromised its style of management would most likely function ineffectively within the Quality Circle structure (Johnson & Ouchi, 1974). Even though an American organization may parallel a Japanese contemporary,

the Quality Circle that was successful in the Japanese organization might not be effective in the American organization.

Rather than indicate whether Quality Circles are as successful in the United States as they are reported to be in Japan, a review of the current Quality Circle literature emphasizes the need for additional research. The present study is an attempt to aid that need.

III. Method

Introduction

This chapter deals with the method employed in conducting our study of the effectiveness of Air Force Quality Circle programs as seen by base-level Quality Circle facilitators. First, the population surveyed will be discussed. Next, we will describe our data collection instrument. Finally, our research procedures and analytical methods will be presented, and assumptions concerning our research effort also will be listed.

Sample

Emory (1980) states that the size of the population - whether it is finite or infinite - has a bearing on whether to use a sample or the entire population. For our research, the entire population, as of 20 January 1984, was known to be 348 Quality Circle facilitators trained by AFIT/LSB in their Quality Circle Facilitator Training Course. Of these 348 facilitators, 150 were military personnel. This latter group constituted the principle source of data for the present study. To be included in our survey group the personnel had to attend the AFIT/LSB training during the period beginning with the pilot class of 31 August 1981, and ending with class OSP 082 84-C which concluded on 20 January 1984. At the time of their respective training dates, these military personnel ranged in rank from Airman First Class to Colonel.

Measures

Validity is defined as the extent to which a test measures what we actually wish to measure (Emory, 1980). This survey instrument (see appendix) was designed with the help of AFIT/LSB, which is the office that trains Air Force Quality Circle facilitators. It was felt that their involvement in the instrument design would help to insure its content validity. In addition, since the targeted respondents were composed of all the military personnel trained as facilitators during the aforementioned time frame, it was felt that useful data would result from surveying the entire population.

The survey instrument broke down into the following seven sections:

Facilitator Characteristics. Respondents were asked if they were now functioning as a facilitator, and if "yes", to specify the year they were trained as a facilitator. If they answered "no", they were asked if they had ever functioned as a facilitator. If they had not, they were asked why they received the training. Possible responses to this last question included: "organization planned to start a Quality Circle but failed to"; "respondent was reassigned"; "to gain an understanding of Quality Circles"; and "other", in which they were asked to identify reasons not in the previous three choices. The respondents were asked if they had ever been a member of a

Quality Circle, with those answering "no" returning the survey at that point. The performance of an organization's Quality Circle facilitation was measured as either a full or part-time function.

Quality Circle Composition Characteristics. Quality Circle meeting frequency was measured using four possible response choices: "at least once a week"; "one to two times a month"; "as needed"; and "other", in which they were to specify the meeting frequency. The average number of members in each Quality Circle was measured with an item providing four responses ranging from "four or less" to "over 15". Voluntary participation was determined by a "yes" or "no" response.

Training. The year facilitator training was received by the respondent was measured from "prior to 1977" to "1983". Respondents were next asked to identify who helped implement their organization's first Quality Circle. This was an open-ended item with no choices provided. Initial Quality Circle member classroom training offered by a base level program was measured on a scale which ranged from "zero" to "over 35" hours. Advanced Quality Circle member classroom training was measured with a similar scale. Local Quality Circle training emphasis was identified by having the respondent choose the emphasis of his/her training from the five following possible responses: "Quality Circle tools"; "problem-solving skills"; "group dynamics";

"attitude change"; or "other" (and specify an answer if different from the previous four).

Management and Union Involvement. A "yes" or "no" response was elicited to determine if management had been briefed on their organization's Quality Circles. Techniques used by a facilitator to inform management of the Quality Circle process included three response choices: "Quality Circle meeting minutes"; "facilitator briefings"; and "other" (where they were asked to specify their techniques). The range of management support and cooperation was measured on a five point scale from "very uncooperative" to "very cooperative", including a "can't decide" category. Management's resource support was measured on a three point scale from "inadequate" to "abundant". Finally, regarding management involvement with their Quality Circle programs, respondents were asked to provide ideas for additional training for supervisors by completing an open-ended item. Respondents were then asked if they had unions in their organizations. Type of union member involvement was surveyed through four possible responses: "steering committee membership"; "management presentation attendance"; "circle membership"; and "other".

Detailed Planning. The existence of a written implementation plan was determined by a "yes" or "no" response. Likewise, steering committee existence was measured in a similar manner.

Miscellaneous. The motivation behind Quality Circle implementation was identified through six choices: "improved productivity"; "improved employee morale"; "improved employee management skills"; "improved employee technical skills"; "improved communication between employees and management"; and "other". Date the organization's first Quality Circle began was determined by providing possible answers ranging from "prior to 1977" to "1984" or "no Quality Circle yet". Quality Circle program satisfaction was measured by five responses ranging from "very dissatisfied" to "very satisfied". The single most dramatic Quality Circle result was identified through six possible responses: "improved productivity"; "improved employee morale"; "improved work quality"; "improved employee technical skills"; "improved communications between employees and management"; and "other". The proportion of Quality Circle ideas actually implemented was measured with five possible responses ranging from "less than 20%" to "over 80%". Quality Circle failure data was measured by three possible responses; "yes", "no", and "not applicable", with the "yes" answer elaborated by five additional response categories ranging from "10% or less" to "76% or more". Estimates of future change in the number of Quality Circles were solicited through five possible responses ranging from "greatly reducing the number of Quality Circles" to "greatly increasing them".

Program Effectiveness. The responses to all items were compared to the facilitator's evaluation of the level of effectiveness of his/her Quality Circle program. Effectiveness was measured on a five point scale from "very ineffective" to "very effective" with a value of "3" attached to a middle category of "can't decide".

Procedure.

The survey instrument consisted of 32 questions concerned with several aspects of Quality Circles in the United States Air Force. A written survey was used due to its reputation for versatility and economy (Emory, 1980). The survey was designed to be virtually self-administering.

Surveys were sent through Air Force distribution channels on 20 April, 1984 to 150 Air Force military personnel trained by AFIT/LSB as Quality Circle facilitators. Names and addresses of this AFIT-trained population were supplied by AFIT/LSB from class rosters maintained by that organization. Although no system was established by AFIT/LSB to update the addresses after the trainees left the school, the rosters were the most accurate and representative source of population membership information available. Addressees were asked to reply within two weeks from receipt of the survey instrument, using the return-addressed envelope provided. Actual data compilation began 30 days after mail-out to provide some leeway for late completion. We imposed the time limitation

based on past AFIT/LSB experience that those who are concerned and intend to respond will do so within two weeks of solicitation (Steel, 1983), and also to meet our time requirements for completion of the research while at AFIT. Respondents were advised their responses would be used in a Quality Circle research effort without reference to the respondent's specific identity so anonymity could be maintained.

Seventy of the surveys were returned for a 46.67% response rate. Of those 70 surveys, seven were unuseable due to reasons ranging from surveys being filled out by persons other than the addressee to incorrect completion of the survey. There were then 63 useable responses, of which 26 answered the entire survey.

Data Analysis

The data were compiled by listing the responses on OPSCAN answer sheets and having them read into a HARRIS 500 computer. An item asking the Quality Circle facilitator to rate the effectiveness of his/her Quality Circle program was dichotomized at the mean, and the resulting groups of "more effective" and "less effective" Quality Circle programs were utilized to test other variables for concomitant differences. Crosstabulations were performed on several items and chi-squares utilized to determine if significant differences existed between more or less effective programs on any item.

Assumptions

We assumed that non-response error would not be a factor. Emory defines non-response error as bias created due to the failure of some respondents to return the survey with the resultant lack of response possibly having significant impact on the outcome of the research (Emory, 1980). Our assumption was based on the premise that the responses to our survey would provide at least a representative sample of the population should the complete population fail to respond.

IV. Results

Introduction

This chapter consists of analysis and reporting of the study's results.

Analysis

The survey was designed to meet the research objectives of identifying characteristics significantly impacting the effectiveness of Quality Circle programs. An item dealing with the facilitator's perceived level of effectiveness of his/her Quality Circle program was used as the foundation on which analyses were based. In reporting these results, the terms effective and ineffective refer to this perceived level of Quality Circle program effectiveness.

Perceived effectiveness was dichotomized at the mean and groups of relatively "more effective" and "less effective" Quality Circle programs formed. Responses of "very effective" and "somewhat effective" were grouped in the "effective" category and responses of "very ineffective", "somewhat ineffective", and "can't decide" were categorized as "ineffective". The ineffective category included "can't decide" on the assumption that a respondent not able to decide on the effectiveness of his/her Quality Circle program most likely had an ineffective program.

Responses to the other survey questions were crosstabulated against the dichotomized categories of perceived effectiveness. Chi-squares were then computed to

identify differences on other variables potentially related to Quality Circle effectiveness. In addition to chi-square, a mean difference test (t-test) was performed on the degree of facilitator satisfaction with his/her program to determine statistical differences between this and the facilitators' perceived level of Quality Circle program effectiveness. Results of the survey and analysis of all the questions are reported in the following paragraphs and tables.

Facilitator Characteristics

Characteristics of the respondents were gathered to separate the respondents into those functioning, or who had functioned in the past as facilitators, from those who never functioned as facilitators. Responses to these measures were not tested for statistical significance since these characteristics of the facilitators were not related to the effectiveness or ineffectiveness of the Quality Circle programs.

Two items in the survey dealt with present and past functioning as a Quality Circle facilitator. The first of these asked: "Are you functioning as a Quality Circle facilitator?". Out of 63 respondents, 15 currently were functioning as facilitators while 48 were not. In percentages, 23.38% of the respondents were currently performing facilitator duties. The next item asked: "Did you ever function as a Quality Circle facilitator?" This

question sought to determine whether those not currently performing facilitator duties may have done so in the past. Of the 48 respondents not currently performing as facilitators, 11 had functioned as facilitators in the past but had quit. The other 37 respondents never applied their facilitator training in an actual Quality Circle program. The result of combining these two items indicates that 41.27% of the 63 respondents currently function or had previously functioned as Quality Circle facilitators.

For those who never functioned as a facilitator, a question was asked to find out why they received Quality Circle facilitator training. The intent of AFIT/LSB's facilitator training is to train facilitators who will directly apply their knowledge to operating Quality Circles (Rehg, 1984). This item sought to determine why the respondents took the training and yet never functioned as facilitators. The respondents' cited changes in their organizations' intent to implement a Quality Circle program, and their own desire to understand Quality Circles as the primary reasons for taking the training. Table 1 summarizes this result.

Respondents were then asked if they had ever been a member of a Quality Circle. The purpose of this item was to determine whether the respondent, if never functioning as a facilitator, had ever been a member of a Quality Circle. If the response was "yes", they were instructed to complete the survey as their views would be included in the results.

TABLE 1

Reasons for Taking Quality Circle Facilitator Training

<u>Why trained</u>	<u>Number of respondents</u>
Organization planned to start a Quality Circle but did not	14
The respondent was reassigned	3
To better understand Quality Circles	13
Not enough time to implement Quality Circles, due to workload	3
Directed by higher echelon of management	3
Learn current mgmt techniques	<u>1</u> 37

Their input was included under the assumption that the training they received through the AFIT/LSB Facilitator Training Course would provide them the same ability to Judge their Quality Circle programs as those who were actually functioning as facilitators. The same 11 respondents who previously functioned as facilitators also answered "yes" to this item. As a result, respondents who answered the survey were classified as either currently or previously affiliated with Quality Circles in a capacity either as facilitator or member, or never dealt with them at all after receiving the AFIT facilitator training. The 37 respondents who had never been affiliated with Quality Circles were instructed by the survey to stop there and return the survey since they had no Quality Circle experience to assess.

Facilitator commitment was measured by asking each participant how their organizations' Quality Circle facilitation was performed. This question was designed to describe facilitation as the respondent's full or part-time job. If a respondent belonged to an organization with more than one facilitator, the respondent was asked for the characteristics of each one. The results included one organization with both full and part-time facilitators, two organizations that used full time facilitators, and nineteen organizations that used part time facilitators. The remaining four individuals either no longer had active Quality Circles (two respondents) or left the item blank. A chi-square test of facilitator commitment revealed no

significant difference in the effectiveness of Quality Circle programs with either full-time or part-time facilitators. Table 2 summarizes these results.

Quality Circle Composition Characteristics

Characteristics of the respondent's Quality Circle(s) were obtained through items asking for meeting frequency, average Quality Circle membership, and whether participation was voluntary.

Meeting frequency was measured by asking: "How often does/do these Quality Circle(s) meet?" A chi-square test revealed no statistical evidence to indicate that frequency of meetings was related to perceived Quality Circle program effectiveness. Table 3 summarizes these results.

Quality Circle group size was measured with an item asking: "What is the average number of members in your organization's Quality Circle(s)?" Out of 24 responses, 21 cases (87.5%) indicated between five to ten members. However, a chi-square test indicated that group size has little relationship to a Quality Circle program's effectiveness. Table 4 provides statistics relevant to this analysis.

"Is Quality Circle participation in your organization voluntary?" was used to measure Quality Circle group volunteerism. This question provided insight into whether voluntary or involuntary participation in Quality Circles impacts the perceived effectiveness of Quality Circles.

TABLE 2

Full or Part-time Facilitator

Frequency Tot Pct	Full- time	Part- time	Both full-time and part-time	No longer active or no answer	Row Total
Ineffective Programs	2 7.7	8 30.8	1 3.8	1 3.8	12 46.2
Effective Programs	0 0.0	11 42.3	0 0.0	3 11.5	14 53.8
Column Total	2 7.7	19 73.1	1 3.8	4 15.4	26 100.0

Raw chi-square = 4.34555
 3 degrees of freedom
 Significance = 0.2265

TABLE 3

Frequency of Quality Circle Meetings

Frequency Tot Pct	At least once a week	1 to 2 times a month	As needed	Other	Row Total
Ineffective Programs	5 19.2	5 19.2	1 3.8	1 3.8	12 46.2
Effective Programs	7 26.9	2 7.7	0 0.0	5 19.2	14 53.8
Column Total	12 46.2	7 26.9	1 3.8	6 23.1	26 100.0

Raw chi-square = 5.16241
 3 degrees of freedom
 Significance = 0.1603

TABLE 4

Average Number of Members in the Quality Circle

Frequency Tot Pct	4 or less	5 to 10	Row Total
Ineffective Programs	2 8.3	9 37.5	11 45.8
Effective Programs	1 4.2	12 50.0	13 54.2
Column Total	3 12.5	21 87.5	24 100.0

Raw chi-square = 0.59940

1 degree of freedom

Significance = 0.4388

Number of missing observations = 2

Participation was reported as voluntary by all 26 respondents with facilitator experience in Quality Circle undertakings. No statistical tests were appropriate.

Training

In the survey instrument, items directly addressing the training which a facilitator gives to his/her organization's Quality Circles was assessed.

The year of initial facilitator training was determined by asking: "In what year were you trained as a Quality Circle facilitator?" Of the 26 respondents who completed the entire survey, 53.8% were trained in 1983. This contrasted with 34.6% in 1982 and 7.7% in 1981. Table 5 shows the breakdown of this data. Chi-square analysis revealed no apparent significance between the year a facilitator was trained and the perceived effectiveness of his/her Quality Circle program.

Initial training of an organization's Quality Circle participants was determined by asking: "Who conducted the training that enabled your organization to start its first Quality Circle?" Table 6 shows the frequencies and percentages for each response group. The response "AFIT" received the largest percentage with 38.46%. The category "unknown" was composed of responses which had individual names not associated with any one group and received 26.92% of the total responses. No statistical difference could be

TABLE 5

Year of Quality Circle Facilitator Training

Frequency Tot Pct	1979	1981	1982	1983	Row Total
Ineffective Programs	1 3.8	0 0.0	3 11.5	8 30.8	12 46.2
Effective Programs	0 0.0	2 7.7	6 23.1	6 23.1	14 53.8
Column Total	1 3.8	2 7.7	9 34.6	14 53.8	26 100.0

Raw chi-square = 4.15646
 3 degrees of freedom
 Significance = 0.2451

TABLE 6

Provider of Organization's Initial Quality Circle Training

Frequency Tot Pct	AFIT	AFIT and someone else	Contractors	Unknown	Row Total
Ineffective Programs	5 20.0	1 4.0	2 8.0	4 16.0	12 48.0
Effective Programs	8 32.0	1 4.0	1 4.0	3 12.0	13 52.0
Column Total	13 52.0	2 8.0	3 12.0	7 28.0	25 100.0

Raw chi-square = 1.13031
 3 degrees of freedom
 Significance = 0.7698
 Number of missing observations = 1

determined between the effective and ineffective groups with respect to the initial source of Quality Circle training.

The time allotted for Quality Circle member initial training was determined by asking: "Approximately how many classroom hours of initial training has your organization's average Quality Circle member received?". The responses varied across the spectrum. However, the majority of the respondents answered in the 0 to 12 hour range (65.3%). As shown in Table 7, no significant difference between the number of hours effective Quality Circle programs train Quality Circle members and the number of hours less effective Quality Circle programs provide in member training was apparent. Similarly, respondents were asked: "Approximately how many classroom hours of advanced training has your organization's average Quality Circle member received?" Unlike the previous item, there was no broad range of answers to interpret. The vast majority of responses (80.8%) were in the 0 to 4 hour category. However, chi-square analysis revealed no statistically significant difference between the responses given by the effective and ineffective groups (see Table 8).

The emphasis of a Quality Circle program's training was determined by asking: "What does your organization's Quality Circle training emphasize the most?" Of the five possible answers, "problem-solving skills" was the most frequent response comprising 50% of the total. In the category marked "other", only two of the four responses were useable,

TABLE 7
Initial Classroom Training Hours

Frequency Tot Pct	0 - 4	5 - 8	9 - 12	13 - 16	17 - 25	Over 35	Row Total
Ineffective Programs	4 15.4	2 7.7	3 11.5	1 3.8	2 7.7	0 0.0	12 46.2
Effective Programs	3 11.5	3 11.5	2 7.7	2 7.7	1 3.8	3 11.5	14 53.8
Column Total	7 26.9	5 19.2	5 19.2	3 11.5	3 11.5	3 11.5	26 100.0

Raw chi-square = 4.07982
5 degrees of freedom
Significance = 0.5380

TABLE 8
Advanced Classroom Training Hours

Frequency Tot Pct	0 - 4	5 - 8	9 - 12	Over 35	Row Total
Ineffective Programs	10 38.5	0 0.0	1 3.8	1 3.8	12 46.2
Effective Programs	11 42.3	2 7.7	0 0.0	1 3.8	14 53.8
Column Total	21 80.8	2 7.7	1 3.8	2 7.7	26 100.0

Raw chi-square = 2.91100
3 degrees of freedom
Significance = 0.4056

with one being "all of the tools" and the other "group dynamics and attitude change". Table 9 shows that the chi-square analysis revealed no significant difference between the training emphasis of effective versus ineffective groups.

Management and Union Involvement

Four items addressed the degree to which an organization's management is involved in the Quality Circle process. The remaining two items addressed union involvement. Chi-square analysis was performed on all items except for the one dealing with ideas on additional training for supervisors, and these tests are referenced throughout this section.

Respondents were asked if all managers where Quality Circles existed had attended a briefing on Quality Circles. Seventy-two percent of the respondents answered that their managers had been briefed. However, chi-square analysis showed no statistically significant difference between the effective and ineffective groups on this point. Table 10 reports these results.

The method of communication between the Quality Circle group and management was determined by asking: "How is management kept informed of the Quality Circle process?" On this item, 21.7% of the respondents reported that management was kept informed by receiving a copy of Quality Circle meeting minutes, 43.5% reported the facilitator briefed

TABLE 9

Emphasis of Quality Circle Training

Frequency Tot Pct	Quality Circle tools	Problem- solving skills	Group dynamics	Other	Row Total
Ineffective Programs	1 3.8	4 15.4	5 19.2	2 7.7	12 46.2
Effective Programs	1 3.8	9 34.6	2 7.7	2 7.7	14 53.8
Column Total	2 7.7	13 50.0	7 26.9	4 15.4	26 100.0

Raw chi-square = 3.07313
 3 degrees of freedom
 Significance = 0.3805

TABLE 10

Managers Attended Quality Circle Briefings

Frequency Tot Pct	Yes	No	Row Total
Ineffective Programs	7 28.0	4 16.0	11 44.0
Effective Programs	11 44.0	3 12.0	14 56.0
Column Total	18 72.0	7 28.0	25 100.0

Raw chi-square = 0.68156
 1 degree of freedom
 Significance = 0.4091
 Number of missing observations = 1

management, and 34.8% used other methods. Some of these other methods included: to provide both minutes and have the facilitator brief; have the group leader, Quality Circle member, or the entire Quality Circle group brief management; with a final response indicating that it was "too early to 'broadcast'" how management is kept informed. Once again, a chi-square test revealed no statistically significant difference between the answers of the effective group versus those of the ineffective group. Table 11 summarizes these results.

Management support and cooperation was measured by asking: "How supportive and cooperative have managers and supervisors been in dealings with your Quality Circle(s)?" The possible answers ranged from "very uncooperative" to "very cooperative", with the answer "can't decide" included. The responses tended to lie in the middle range, with "somewhat uncooperative" and "somewhat cooperative" each having 28%. The responses "can't decide" and "very cooperative" each had 16%, and only 12% of the respondents said managers and supervisors were "very uncooperative" in their dealings with Quality Circles. No significant difference between the effective and ineffective groups was found through the chi-square test. Table 12 summarizes these results.

Management's resource support of the Quality Circle program was measured by asking: "To what degree has

TABLE 11

Method of Quality Circle Information Dissemination

Frequency Tot Pct	Quality Circle meeting	Facilitator briefs mgmt	Other	Row Total
Ineffective Programs	3 13.0	3 13.0	4 17.4	10 43.5
Effective Programs	2 8.7	7 30.4	4 17.4	13 56.5
Column Total	5 21.7	10 43.5	8 34.8	23 100.0

Raw chi-square = 1.43308
 2 degrees of freedom
 Significance = 0.4884
 Number of missing observations = 3

TABLE 12

Support and Cooperation of Managers and Supervisors

Frequency Tot Pct	Very uncoop- erative	Some- what uncoop- erative	Can't decide	Some- what coop- erative	Very coop- erative	Row Total
Ineffective Programs	2 8.0	2 8.0	2 8.0	3 12.0	3 12.0	12 48.0
Effective Programs	1 4.0	5 20.0	2 8.0	4 16.0	1 4.0	13 52.0
Column Total	3 12.0	7 28.0	4 16.0	7 28.0	4 16.0	25 100.0

Raw chi-square = 2.72627

4 degrees of freedom

Significance = 0.6046

Number of missing observations = 1

management willingly provided tangible resources needed by the program?" The majority of respondents (80%) stated that they received "sufficient resources" for their Quality Circle programs. Only 8% felt they received "abundant resources", while 12% reported receiving "inadequate resources". Again, no statistically reliable difference could be found through chi-square analysis. Table 13 reports these findings.

Suggestions for additional supervisor training were solicited from the respondents by asking: "What type of additional training would aid the supervisors in their understanding of Quality Circles?" This "fill in the blank" item resulted in answers which were classified into six categories. In addition, there were classifications for "no response" and "unuseable data". The bulk of the responses, 34.61%, felt supervisors should attend a Quality Circle familiarization course to better understand the process and to hopefully lose their fear of the Quality Circle program. Table 14 summarizes the responses for this question.

Union existence in the facilitator's organization was determined by asking: "Do you have a union in your organization?" There were 61.5% of the respondents with unions in their organizations. The remaining 38.5% had no unions. Once again, as shown in Table 15, chi-square analysis revealed no significant difference between the responses of the effective and ineffective groups.

TABLE 13

Amount of Management Provided Resources

Frequency Tot Pct	Inadequate resources	Sufficient resources	Abundant resources	Row Total
Ineffective Programs	1 4.0	8 32.0	2 8.0	11 44.0
Effective Programs	2 8.0	12 48.0	0 0.0	14 56.0
Column Total	3 12.0	20 80.0	2 8.0	25 100.0

Raw chi-square = 2.81385

2 degrees of freedom

Significance = 0.2449

Number of missing observations = 1

TABLE 14
Recommended Additional Training for Supervisors

Frequency Tot Pct	No addi- tional training	Attend familiar- ization training	Attend Quality Circle meetings	One-on- one training	More advanced training	video presen- tations	Row Total
Ineffective Programs	0 0.0	5 31.3	0 0.0	1 6.3	0 0.0	0 0.0	6 37.5
Effective Programs	1 6.3	4 25.0	1 6.3	0 0.0	2 12.5	2 12.5	10 62.5
Column Total	1 6.3	9 56.3	1 6.3	1 6.3	2 12.5	2 12.5	16 100.0

number of missing observations = 10

TABLE 15
Unions in the Organizations

Frequency Tot Pct	Yes	No	Row Total
Ineffective Programs	6 23.1	6 23.1	12 46.2
Effective Programs	10 38.5	4 15.4	14 53.8
Column Total	16 61.5	10 38.5	26 100.0

Raw chi-square = 1.25357
1 degree of freedom
Significance = 0.2629

Union involvement was measured by asking: "How are union members involved in your Quality Circles?" The majority of the responses (64%) replied in the category marked "other". Within this category, nine respondents answered "N/A", and one failed to answer this item at all. This corresponded with the ten respondents reporting no union involvement in their organizations. Of the remaining respondents answering "other", four reported no union involvement, and two had union members both on the steering committee and involved as Quality Circle members. The final respondent had unions involved with the steering committee, attending management presentations, and as Quality Circle members. The other response categories were "circle members" with 28% of the responses, and "steering committee" with 8%. Table 16 shows the chi-square analysis for this item, and Table 17 shows the breakdown of the responses in the category titled "other". The Chi-square analysis revealed no statistically significant differences between the effective and ineffective groups.

Detailed Planning

In this section, the results of items dealing with planning factors are reported.

The respondents were asked: "Was an implementation plan written for your Quality Circle program?" Of the respondents, 69.2% answered "yes". However, the most

TABLE 16

Union Member Quality Circle Involvement

Frequency Tot Pct	Steering committee	Quality Circle member	Other	Row Total
Ineffective Programs	0 0.0	2 8.0	9 36.0	11 44.0
Effective Programs	2 8.0	5 20.0	7 28.0	14 56.0
Column Total	2 8.0	7 28.0	16 64.0	25 100.0

Raw chi-square = 3.22211

2 degrees of freedom

Significance = 0.1997

Number of missing observations = 1

TABLE 17

Union Member Quality Circle Involvement:
Breakdown of "Other"

Frequency Tot Pct	N/A	Not involved	Steering committee & QC member	Steering committee, QC member & mgmt pres- tations	Row Total
Ineffective Programs	5 31.2	2 12.5	1 6.2	1 6.2	9 56.2
Effective Programs	4 25.0	2 12.5	1 6.2	0 0.0	7 43.8
Column Total	9 56.2	4 25.0	2 12.5	1 6.2	16 100.0

significant result was that 85.7% of those who perceived their program as effective answered "yes" to this item (see Table 18). Chi-square analysis revealed that a significant difference existed between the effective and ineffective groups, with the effective group more likely to have an implementation plan written for their program.

Respondents were then asked if their organization had a steering committee. A majority of the responses were "yes", with 61.5% of the respondents giving this answer. Of those reporting effective Quality Circle programs, 71.4% answered "yes". The results of the chi-square analysis are shown in Table 19. No significant relationship existed between the responses on this item and the groups effective or ineffective Quality Circle programs.

Miscellaneous

Several other characteristics of Quality Circle programs measured in the study could not be readily grouped into the preceding categories. Responses were measured against the facilitator's perceived level of Quality Circle program effectiveness to identify factors that potentially impact on that effectiveness.

Reasons for implementing Quality Circles were determined by asking: "What was the motivation behind the decision to implement Quality Circles within your organization?" Respondents rank ordered characteristics explaining the motivation behind implementation of their

TABLE 18

Written Quality Circle Implementation Plan

Frequency Tot Pct	Yes	No	Row Total
Ineffective Programs	6 23.1	6 23.1	12 46.2
Effective Programs	12 46.2	2 7.7	14 53.8
Column Total	18 69.2	8 30.8	26 100.0

Raw chi-square = 3.86905
 1 degree of freedom
 Significance = 0.0492

TABLE 19

Quality Circle Steering Committees

Frequency Tot Pct	Yes	No	Row Total
Ineffective Programs	6 23.1	6 23.1	12 46.2
Effective Programs	10 38.5	4 15.4	14 53.8
Column Total	16 61.5	10 38.5	26 100.0

Raw chi-square = 1.25357
 1 degree of freedom
 Significance = 0.2629

Quality Circles. However, for statistical analysis only first choices were used. Chi-square analysis revealed no significant relationship between this item and perceived effectiveness. Table 20 summarizes these results.

The facilitators were asked: "When was your organization's first Quality Circle begun?" This item provided descriptive data on the respondent's Quality Circles, and chi-square analysis disclosed no statistical relationship with rated effectiveness. However, it did reveal that most of the respondents' Quality Circles were begun in either 1982 (10 respondents) or 1983 (11 respondents). Table 21 summarizes these results.

Facilitator satisfaction with their Quality Circle program was determined by asking: "How satisfied have you been with your organization's Quality Circle program?" This item was designed to determine if the respondent's perceived level of satisfaction with his/her Quality Circle program related to the perceived effectiveness of their program. A majority (12 out 26, 46.15%) were "somewhat satisfied" with their Quality Circle program. However, neither chi-square analysis nor t-tests revealed significant relationships with responses dealing with the perceived effectiveness of the respondents' Quality Circle programs. Table 22 summarizes these results.

Respondents were asked to indicate the single most dramatic result obtained by their organization's Quality

TABLE 20

Motivation for Quality Circle Implementation

Frequency Tot Pct	Improve produc- tivity	Improve employee morale	Improve communi- cation	Other	Row Total
Ineffective Programs	4 16.7	1 4.2	3 12.5	2 8.3	10 41.7
Effective Programs	6 25.0	5 20.8	3 12.5	0 0.0	14 58.3
Column Total	10 41.7	6 25.0	6 25.0	2 8.3	24 100.0

Raw chi-square = 4.52571

3 degrees of freedom

Significance = 0.2100

Number of missing observations = 2

TABLE 21

Year of Organization's First Quality Circle

Frequency Tot Pct	1978	1980	1981	1982	1983	1984	Row Total
Ineffective Programs	1 3.8	0 0.0	4 15.4	5 19.2	1 3.8	1 3.8	12 46.2
Effective Programs	0 0.0	2 7.7	6 23.1	6 23.1	0 0.0	0 0.0	14 53.8
Column Total	1 3.8	2 7.7	10 38.5	11 42.3	1 3.8	1 3.8	26 100.0

Raw chi-square = 5.36883
 5 degrees of freedom
 Significance = 0.3725

TABLE 22
Facilitators' Satisfaction with Their Quality Circles

Frequency Tot Pct	Very dissat- isfied	Some- what dissat- isfied	Neutral	Some- what satisfied	Very satisfied	Row Total
Ineffective Programs	4 15.4	2 7.7	2 7.7	3 11.5	1 3.8	12 46.2
Effective Programs	1 3.8	3 11.5	1 3.8	9 34.6	0 0.0	14 53.8
Column Total	5 19.2	5 19.2	3 11.5	12 46.2	1 3.8	26 100.0

Raw chi-square = 6.21627
4 degrees of freedom
Significance = 0.1836

Circle(s). Answers varied with chi-square analysis revealing no single answer significantly related to the perceived effectiveness of the respondent's Quality Circle program. Table 23 summarizes these results.

Facilitators were asked the proportion of Quality Circle ideas and proposals actually implemented by each of their organizations. Responses of those surveyed revealed no significant relationship between the percent of Quality Circle proposals adopted and the perceived effectiveness of the program. However, of the 25 respondents answering this item, 11 (44%) reported less than 20% of their Quality Circle group's ideas were actually implemented. Table 24 summarizes these results.

Quality Circle program failure data was gathered by asking: "Have any of your organization's Quality Circles failed, disbanded, or re-entered training?". Of the 26 facilitators responding to this item, only 4 (15.4%) experienced none of the problems described in the item. Twenty experienced failed, disbanded, or Quality Circles that re-entered training. Table 25 summarizes these results.

Facilitators were asked to estimate the types of changes anticipated in the number of Quality Circles in their organization over the next year or two. The majority of the respondents (20 of 25) predicted future growth in the number of their organization's Quality Circles. Chi-square

TABLE 23

Facilitators' Most Dramatic Improvement from Their Quality Circles

Frequency Tot Pct	Product- ivity	Employee morale	Work quality	Employee technical skills	Commun- ication	Row Total
Ineffective Programs	0 0.0	2 7.7	1 3.8	3 11.5	6 23.1	12 46.2
Effective Programs	1 3.8	4 15.4	3 11.5	3 11.5	3 11.5	14 53.8
Column Total	1 3.8	6 23.1	4 15.4	6 23.1	9 34.6	26 100.0

Raw chi-square = 3.53373

4 degrees of freedom

Significance = 0.4728

TABLE 24
Percent of Quality Circle Ideas Implemented

Frequency Tot Pct	Less than 20%	20 - 40%	40 - 60%	60 - 80%	Over 80%	None yet	Row Total
Ineffective Programs	6 24.0	1 4.0	1 4.0	0 0.0	1 4.0	2 8.0	11 44.0
Effective Programs	5 20.0	2 8.0	3 12.0	1 4.0	2 8.0	1 4.0	14 56.0
Column Total	11 44.0	3 12.0	4 16.0	1 4.0	3 12.0	3 12.0	25 100.0

Raw chi-square = 2.77081

5 degrees of freedom

Significance = 0.7353

Number of missing observations = 1

TABLE 25
Quality Circle Failures

Frequency Tot Pct	Yes	No	N/A	Row Total
Ineffective Programs	8 30.8	2 7.7	2 7.7	12 46.2
Effective Programs	12 46.2	2 7.7	0 0.0	14 53.8
Column Total	20 76.9	4 15.4	2 7.7	26 100.0

Raw chi-square = 2.66190
2 degrees of freedom
Significance = 0.2642

analysis, however, showed no significant relationship between these predictions and the perceived effectiveness of the respondent's Quality Circle programs. Table 26 summarizes these results.

TABLE 26
Forecasted Change in Quality Circle Numbers

Frequency Tot Pct	Greatly reduced	Slightly reduced	No change	Slightly increased	Row Total
Ineffective Programs	2 8.0	1 4.0	4 16.0	5 20.0	12 48.0
Effective Programs	1 4.0	1 4.0	3 12.0	8 32.0	13 52.0
Column Total	3 12.0	2 8.0	7 28.0	13 52.0	25 100.0

Raw chi-square = 1.13031
3 degrees of freedom
Significance = 0.7698
Number of missing observations = 1

V. Discussion

Introduction

This chapter provides a brief discussion of the study's findings, and some conclusions drawn from these findings. The authors' recommendations for future research are then provided.

Findings

The results of our research, though highly tentative, support only one hypothesis, and then only partially. Detailed planning in the form of the implementation plan was shown to be significantly related to the perceived effectiveness of a Quality Circle program. The majority of facilitators (85.7%) who viewed their Quality Circle program as effective had a written implementation plan. This finding appears to support, in part, our hypothesis that detailed planning for the implementation and operation of a Quality Circle program improves the effectiveness of that program. The other question used to test this hypothesis, which asked whether a steering committee existed, was not significantly related to rated Quality Circle program effectiveness. However, future research with greater sample size may reveal greater steering committee impact on measures of the effectiveness of Quality Circle programs.

The existence of a Quality Circle steering committee, while not statistically related to effectiveness, did produce a result in basic agreement with that for an

implementation plan. The large percentage of effective Quality Circle programs with a steering committee (71.4%) appears to indicate that a relationship could exist between the steering committee and a program's perceived effectiveness. Future research may prove enlightening in this area.

There were three other hypotheses proposed. These dealt with training of both the facilitator and Quality Circle members, the amount of management and union involvement, and the composition characteristics of the Quality Circle program. None of these hypotheses were supported through this research.

Some of our findings, though not statistically significant, produced patterns which may prove significant with future research. Most evident was that a large percentage of the military facilitators trained by AFIT/LSB are not functioning as Quality Circle facilitators. Of the 63 useable surveys returned, 37 (58.73%) were from trained facilitators who never functioned in that capacity. Another 11 (17.46%) of the total respondents were no longer functioning as facilitators. It would appear that a large proportion of facilitator trainees never used their training for its intended purpose. AFIT/LSB may need to reconsider their admission requirements in order to increase the utilization rates of skills acquired in the facilitator training program. Assuming that USAF resources are consumed during the training of each facilitator, scarce financial

resources could be better employed by insuring a higher rate of facilitator skills usage.

Limitations

Several limitations which may effect this study were identified. These include: the descriptive nature of the study; chance of biased data; sample size problems; possible variation of the variables; and, the possibility that the criteria measured may not impact ultimate program success.

This study was descriptive in nature, and its main intent was to gather information on Air Force Quality Circles by questioning military facilitators. The design of the study prohibited drawing conclusions regarding cause and effect relationships between Quality Circle program characteristics and program effectiveness. This is a definite limitation of our findings.

Facilitator bias may also be a limitation of this study. The perceptions of the facilitator were used to try and determine what the traits of an effective Quality Circle were. This left the study wide open for facilitator bias, since they were asked to provide information on the programs for which they were responsible. This situation may have lead to either facilitator over-estimation of Quality Circle effectiveness, if the facilitator was still responsible for the organization's Quality Circle program, or under-estimation, if the facilitator was no longer responsible for the program or had an "axe to grind".

Another potential source of bias may have occurred due to our exclusion of civilian facilitators from this study. We originally planned to include the civilians in the study. However, we encountered problems when trying to have the survey approved for the civilian participants. Since only the military facilitators were surveyed, this may have resulted in bias as far as the representativeness of our sample for the population of Air Force Quality Circle programs.

The small sample size was a major factor limiting the conclusions of this study. Our findings were necessarily based on 63 responses out of a population of 150. Of these 63 responses, only 26 individuals (41.27%) were functioning as facilitators or had ever applied their facilitator training. As a result, our findings were, for most of the items examined, based on those 26 responses. We were unable to accomplish our original plan to survey both AFIT-trained Air Force civilian and military facilitators due to time constraints in obtaining approval for a civilian survey. Since statistical power is a function of sample size, the power of our statistical tests is suspect with such a small sample size.

An additional limitation of our study may have stemmed from the homogeneity of the military sample. The similarity of respondents in the sample may have tended to restrict the variance on our measures and, therefore, lowered variances would translate artificially into fewer significant results.

Another limiting factor in our study involved the criteria selected for examination in our survey. Even though each of these criteria was considered by the authors a priori to be important to Quality Circle program success, their overall importance to the ultimate success or failure of a program could, in fact, be minor. If so, the relationship to effectiveness of the variables measured in the study would be nonsignificant, as we found. Other unmeasured variables may prove much more important than the factors we studied.

Conclusion

Results of this research reveal a high percentage of people participating in the AFIT/LSB facilitator training with no intention of implementing Quality Circles. This is contrary to the intent of the AFIT/LSB Facilitator Training Course admission standards, which require signed statements of commitment by the organizations to the effect that they will begin Quality Circle programs (Rehg, 1984). If AFIT/LSB intends to enforce this admission requirement, then some form of follow-up reporting by AFIT-trained facilitators should be mandatory. This reporting would also aid in tracking facilitators for future study.

Another possible distinction between effective and ineffective Quality Circle programs lies in the Quality Circle tools that a program emphasizes. It appears effective Quality Circles tend to emphasize problem-solving

skills to a greater degree than do ineffective programs. Although not statistically significant, further study, with a larger sample size, may show a significant effect for programs with this emphasis.

The respondents' answers regarding satisfaction with their Quality Circle programs, in some instances, were directly opposed to their views of their programs' effectiveness. One would expect someone who is satisfied with their program to perceive an effective Quality Circle program, and vice versa with dissatisfaction and ineffectiveness. However, four people reporting at least some degree of satisfaction with their Quality Circle programs also reported them as being ineffective. In addition, four people claiming effective programs reported some degree of dissatisfaction with these same programs.

For the purpose of our analysis, those facilitators unable to decide on the effectiveness of their Quality Circle programs were considered to have ineffective programs. While the existence of the "can't decide" on Quality Circle program effectiveness helped explain why four of the respondents answered in the satisfied category, it still does not explain why four people who felt their programs effective were not satisfied with those programs.

Similarly, inconsistencies existed when six respondents reporting effective Quality Circle programs also reported a Quality Circle failure rate of greater than 50%. Indeed, five of those six experienced a failure rate of over 75%.

One would expect research to reveal lower rates of failure for effective programs. As shown above, this was not the case with our research.

Due to the descriptive and highly tentative nature of our findings, the implications of this study to Air Force managers are unclear. The study supported only that effective Quality Circle programs, as perceived by the facilitators, had written implementation plans. No other conclusive findings were apparent from the results regarding the make-up of an effective Quality Circle. As a result, this study provides Air Force managers with no conclusive evidence regarding the requirements for implementation of successful Quality Circle programs in their organizations, nor does it provide information on the benefits those programs might provide. However, managers may cautiously use these descriptive findings as one source of background information when initially considering the application of Quality Circles.

Recommendations for Future Research

This exploratory effort to examine the effectiveness of Air Force Quality Circle programs paves the way for further research in this area. Some suggestions for future research follow:

1. Air Force civilians trained by AFIT/LSB should be surveyed for their views on the effectiveness of their Quality Circle programs. The instrument used for our

research effort should be used in the civilian study so the findings of both studies can be contrasted. However, as a note of warning, the approval process for a survey of Air Force civilians is substantially longer than one for military members. Administration of the survey will also be vastly different due to union involvement.

2. Sample sizes should be increased for improved statistical power.

3. Updating AFIT/LSB's facilitator training roster will insure surveys reach intended targets. To further enhance the response rate, advance telephone contact with each possible respondent will verify their willingness to complete the survey.

4. A measurement technique should be developed to quantitatively determine if an Air Force Quality Circle program is effective. Once developed, this technique can be used to evaluate the Quality Circle programs of both civilian and military facilitators.

5. A study should be performed to determine whether effective Quality Circle programs are attributable more to civilian facilitators than to military ones. A key part of this study should be to examine the transitory nature of the military member and its effect on the Quality Circle program.

As stated earlier, this study is but a small and exploratory effort to examine the effectiveness of Air Force Quality Circle programs. Hopefully it will add to the basic knowledge and evaluation of these programs and aid in examining their impact on the Air Force work environment.

Appendix: Quality Circle Facilitator Survey

SURVEY INSTRUCTIONS

a. This survey is to be completed by the addressee. When answering the survey questions, please choose the answer that most closely corresponds to your Quality Circle program. If your answer to any of the questions is "other", and the space provided with that item is inadequate, please use the attached comment sheet and number each response.

b. Principal purposes. The survey is being conducted to collect information to be used in research aimed at illuminating and providing inputs to the solution of problems of interest to the Air Force and/or DOD.

c. Routine uses. The survey data will be converted to information for use in research of management related problems. Results of the research, based on the data provided, will be included in written master's theses and may also be included in published articles, reports, or texts. Distribution of the results of the research, based on the survey data, whether in written form or presented orally, will be unlimited.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

QUALITY CIRCLE SURVEY

1. Are you functioning as a QC facilitator?

- a. ☐ Yes. Go to question #5.
- b. ☐ No.

2. Did you ever function as a QC facilitator?

- a. ☐ Yes. Go to question #4.
- b. ☐ No.

3. If you have never functioned as a facilitator, why did you receive the training?

- a. — My organization originally planned to start a QC, but decided not to.
- b. — I was going to be a facilitator, but was reassigned.
- c. — Took the training to understand what QCs were all about.
- d. — Other. Please specify: _____

_____.

4. Are you now, or have you been, a member of a QC?

- a. — Yes. Go to question #5.
- b. — No. Do not go on. Please return this survey in the enclosed envelope.

5. In what year were you trained as a QC facilitator?

- a. — Prior to 1977.
- b. — 1978.
- c. — 1979.
- d. — 1980.
- e. — 1981.
- f. — 1982.
- g. — 1983.
- h. — Not yet trained.

6. How is QC facilitation in your organization performed? If there are more than one facilitator in your organization, please specify the number who perform the function full-time—

and/or part-time.

- a. — As full-time function. (give number): _____
- b. — AS part-time function. (give number): _____

7. Who conducted the training that enabled your organization to start its first QC?

_____.

8. Approximately how many classroom hours of initial training has your organization's average QC member received?

- a. ☐ 0 - 4 hours.
- b. ☐ 5 - 8 hours.
- c. ☐ 9 - 12 hours.
- d. ☐ 13 - 16 hours.
- e. ☐ 17 - 25 hours.
- f. ☐ 26 - 35 hours.
- g. ☐ Over 35 hours.

9. Approximately how many classroom hours of advanced training has your organization's average QC member received?

- a. ☐ 0 - 4 hours.
- b. ☐ 5 - 8 hours.
- c. ☐ 9 - 12 hours.
- d. ☐ 13 - 16 hours.
- e. ☐ 17 - 25 hours.
- f. ☐ 26 - 35 hours.
- g. ☐ Over 35 hours.

10. What was the motivation behind the decision to implement QCs within your organization? If more than one response applies, please rank order.

- a. ☐ Improve productivity.
- b. ☐ Improve employee morale.
- c. ☐ Improve employee skills in management.
- d. ☐ Improve employee technical skills.
- e. ☐ Improve communication between employees and supervisors/management.
- f. ☐ Other. Please identify: _____

11. What does your organization's QC training emphasize the most? (Choose only one).

- a. ☐ The QC tools.
- b. ☐ Problem-solving skills.
- c. ☐ Group dynamics. (eg. communication, trust).
- d. ☐ Attitude change.
- e. ☐ Other. Please specify: _____.

12. Was an implementation plan written for your QC program?
- a. ☐ Yes.
 - b. ☐ No.
13. When was your organization's first QC begun?
- a. ☐ Prior to 1977.
 - b. ☐ 1978.
 - c. ☐ 1979.
 - d. ☐ 1980.
 - e. ☐ 1981.
 - f. ☐ 1982.
 - g. ☐ 1983.
 - h. ☐ No QCs yet.
14. How many QCs did/does your organization have:
(Please answer for each period).
- Prior to 1979 _____
Prior to 1981 _____
Prior to 1983 _____
Currently _____
15. How many of your organization's QCs meet regularly (i.e., weekly, monthly, quarterly, etc.)? Please give the number.
- _____
16. How often does/do these QC(s) meet?
- a. ☐ At least once a week.
 - b. ☐ 1 to 2 times a month.
 - c. ☐ As needed (generally less than once a month).
 - d. ☐ Other. Please specify: _____.
17. What is the average number of members in your organization's QC(s)?
- a. ☐ 4 or less.
 - b. ☐ 5 to 10.
 - c. ☐ 11 to 15.
 - d. ☐ Over 15.

18. Is QC participation in your organization voluntary?
- a. ☐ yes.
 - b. ☐ no.
19. Does your organization have a steering committee?
- a. ☐ Yes.
 - b. ☐ No.
20. Have all the managers, where QCs are in existence, attended a briefing on QCs?
- a. ☐ Yes.
 - b. ☐ No.
21. How is management kept informed of the QC process?
- a. ☐ Minutes of the QC meeting provided to management.
 - b. ☐ Facilitator briefs management.
 - c. ☐ Other. Please specify: _____
22. How supportive and cooperative have managers and supervisors been in dealings with your QC(s)?
- a. ☐ Very uncooperative.
 - b. ☐ Somewhat uncooperative.
 - c. ☐ Can't decide.
 - d. ☐ Somewhat cooperative.
 - e. ☐ Very cooperative.
23. To what degree has management willingly provided tangible resources (e.g. training funds, release time) needed by the program?
- a. ☐ Inadequate resources.
 - b. ☐ Sufficient resources.
 - c. ☐ Abundant resources.
24. Do you have a union in your organization?
- a. ☐ yes.
 - b. ☐ no.

25. How are union members involved in your QC(s)?
- a. ☐ On the steering committee.
 - b. ☐ Attend management presentations.
 - c. ☐ Circle members.
 - d. ☐ Other. Please specify: _____
26. How satisfied have you been with your organization's QC program?
- a. ☐ Very dissatisfied.
 - b. ☐ Somewhat dissatisfied.
 - c. ☐ Neutral.
 - d. ☐ Somewhat satisfied.
 - e. ☐ Very satisfied.
27. How effective do you think your QC(s) have been in bringing about change for the better?
- a. ☐ Very Ineffective.
 - b. ☐ Somewhat ineffective.
 - c. ☐ Can't decide.
 - d. ☐ Somewhat effective.
 - e. ☐ Very effective.
28. What was the single most dramatic result obtained by your organization's QC(s)? (Choose only one).
- a. ☐ Improved productivity.
 - b. ☐ Improved employee morale.
 - c. ☐ Improved work quality.
 - d. ☐ Improved employee technical skills.
 - e. ☐ Improved communication between employees and supervisors/management.
 - f. ☐ Other. Please specify: _____
- _____.
29. What proportion of QC ideas and proposals are actually implemented?
- a. ☐ Less than 20%.
 - b. ☐ 20 - 40%.
 - c. ☐ 40 - 60%.
 - d. ☐ 60 - 80%.
 - e. ☐ Over 80%.

30. Have any of your organization's QCs failed, disbanded, or re-entered training?

a. ☐ Yes. What percent of your organization's total QC effort?

<input type="checkbox"/> 10% or less	<input type="checkbox"/> 11% - 25%
<input type="checkbox"/> 26% - 50%	<input type="checkbox"/> 51% - 75%
<input type="checkbox"/> 76% or more	

b. ☐ No.

c. ☐ Not applicable.

31. What type of change do you see in the number of QCs in your organization over the next year or two?

a. ☐ Greatly reducing the number of QCs.

b. ☐ Slightly reducing the number of QCs.

c. ☐ No change.

d. ☐ Slightly increasing the number of QCs.

e. ☐ Greatly increasing the number of QCs.

32. What type of additional training would aid the supervisors in their understanding of QCs? (Please specify).

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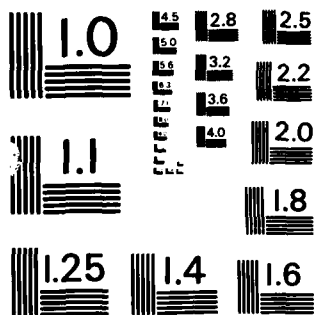
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VITA

Captain Nolan L. Singer was born on 18 September 1955 in Iola, Kansas. He graduated from high school in Moran, Kansas, in 1973 and attended Friends University in Wichita, Kansas, from which he received the degree of Bachelor of Science in Business Administration in 1978. Upon graduation, he was employed as certified insurance counselor until attending the Air Force Officer Training School, where he received his commission on 1 February 1979. He completed Administrative and Executive Support Officer training in March 1979, and was assigned to the 388th Tactical Fighter Wing, Hill AFB, Utah, where he served as a Squadron Section Commander until March 1982. He was then assigned to the Air Force Acquisition Logistics Division, Wright Patterson AFB, Ohio, where he was matrixed to the B-1B System Program Office as the Logistics Readiness Officer in charge of Depot Maintenance Activation for the B-1B. He held that position until entering the School of Systems and Logistics, Air Force Institute of Technology, in May 1983.

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Quality Circles are a Japanese management tool for improving productivity and quality which is gaining wide-spread attention from American management, including the United States Air Force. Since August 1981, the Air Force Institute of Technology, School of Systems and Logistics, Department of Organizational Behavior and Science (AFIT/LSB) has been training both Air Force civilian and military personnel to function as Air Force Quality Circle facilitators. However, no research has been done to determine whether the Quality Circle programs of these AFIT-trained facilitators are effective in improving their organizations' productivity. This thesis project was an exploratory effort to determine the effectiveness of Air Force Quality Circle programs as perceived by the facilitators, and to identify characteristics present in effective programs.

Literature was reviewed which discussed the history of Quality Circles, application and results of Quality Circle implementation, and elements instrumental in successful Quality Circle programs. Air Force military personnel trained by AFIT/LSB as Quality Circle facilitators were surveyed to determine their Quality Circle programs' perceived effectiveness, and to determine characteristics of those programs contributing to their success. Only the use of a written implementation plan surfaced as significantly related to the effectiveness of those programs. This factor, as well as other characteristics examined and their findings, are presented, and recommendations for future research provided.

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